

Amendment and Response

Applicant: David C. Collins

Serial No.: 10/820,952

Filed: April 8, 2004

Docket No.: 200400670-1

Title: GENERATING AND DISPLAYING SPATIALLY OFFSET SUB-FRAMES

IN THE CLAIMS

Please amend the claims as follows.

1. (Currently Amended) A method of displaying an image with a display device, the method comprising:
 - receiving image data for the image with an image processing unit;
 - generating first and second sub-frames with the image processing unit, wherein the first and the second sub-frames comprise a plurality of sub-frame pixel values and a plurality of error values, and wherein at least a first one of the plurality of sub-frame pixel values is calculated using the image data, at least a second one of the plurality of sub-frame pixel values, and at least one of the plurality of error values; and
 - alternating between displaying the first sub-frame, including displaying the first one of the plurality of sub-frame pixel values, in a first position and displaying the second sub-frame, including displaying the second one of the plurality of sub-frame pixel values, in a second position spatially offset from the first position with the display device;
 - wherein a region of influence associated with the first one of the plurality of sub-frame pixel values comprises a number of pixel values that corresponds to a number of iterations used to generate the first and the second sub-frames.
2. (Original) The method of claim 1 wherein the image comprises a plurality of image pixels, wherein each of the plurality of sub-frame pixel values corresponds to a sub-frame pixel that is centered with respect to one of the plurality of image pixels.
3. (Currently Amended) The method of claim 1 further comprising:
 - generating the first and the second sub-frames with the image processing unit using first and second simulation kernels.
4. (Currently Amended) The method of claim 3 further comprising:

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generating the first and the second sub-frames, wherein the first one of the plurality of sub-frame pixel values is calculated with the image processing unit using the first simulation kernel in response to an initial value associated with the first one of the plurality of sub-frame pixel values being non-zero, and wherein the first one of the plurality of sub-frame pixel values is calculated with the image processing unit using the second simulation kernel in response to the initial value associated with the first one of the plurality of sub-frame pixel values being zero.

5. (Currently Amended) The method of claim 1 further comprising:

generating the first and the second sub-frames with the image processing unit using an error kernel.

6. (Canceled)

7. (Currently Amended) The method of claim 1 further comprising:

generating third and fourth sub-frames with the image processing unit, the first, the second, the third, and the fourth sub-frames comprising the plurality of sub-frame pixel values; and

alternating between displaying the first sub-frame in the first position and displaying the second sub-frame in the second position spatially offset from the first position, displaying the third sub-frame in a third position spatially offset from the first position and the second position, and displaying the fourth sub-frame in a fourth position spatially offset from the first position, the second position, and the third position with the display device.

8. (Canceled)

9. (Currently Amended) The method of claim 7 wherein the first one of the plurality of sub-frame pixel values is calculated with the image processing unit using the image data, the second one of the plurality of sub-frame pixel values, and a third one of the plurality of sub-frame pixel values that is associated with the third sub-frame.

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10. (Currently Amended) The method of claim 1 further comprising:

generating the first and the second sub-frames, wherein the first and the second sub-frames comprise the plurality of sub-frame pixel values and the plurality of error values, and wherein at least the first one of the plurality of sub-frame pixel values is calculated with the image processing unit using the image data, at least the second one of the plurality of sub-frame pixel values, at least the one of the plurality of error values, and a plurality of sharpening factors.

11. (Currently Amended) The method of claim 1 further comprising:

generating each of the plurality of error values with the image processing unit such that a first number of bits of each of the plurality of error values is equal to a second number of bits of each of the plurality of sub-frame pixel values.

12. (Currently Amended) A system for displaying an image, the system comprising:

a buffer adapted to receive image data for the image;

an image processing unit configured to generate first and second sub-frames comprising a plurality of rows of sub-frame pixel values, wherein each of the sub-frame pixel values in each of the plurality of rows is calculated using the image data, at least one sub-frame pixel value from a previous one of the plurality of rows, and at least one error value; and

a display device adapted to alternately display the first sub-frame in a first position and the second sub-frame in a second position spatially offset from the first position;

wherein each of the sub-frame pixel values in each of the plurality of rows is calculated using a number of pixel values from the image data and the previous one of the plurality of rows that corresponds to a number of iterations used to generate the first and second sub-frames.

13. (Original) The system of claim 12 wherein the image processing unit is configured to generate the first and the second sub-frames using first and second simulation kernels.

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14. (Original) The system of claim 13 wherein the first simulation kernel comprises first, second, and third rows which each comprise three coefficients, wherein the three coefficients of the first row have values of $1/8$, 0 , and $1/8$, respectively, wherein the three coefficients of the second row have values of 0 , $4/8$, and 0 , respectively, and wherein the three coefficients of the third row have values of $1/8$, 0 , and $1/8$, respectively, and wherein the second simulation kernel comprises fourth, fifth, and sixth rows which each comprise three coefficients, wherein the three coefficients of the fourth row have values of 0 , $2/8$, and 0 , respectively, wherein the three coefficients of the fifth row have values of $2/8$, 0 , and $2/8$, respectively, and wherein the three coefficients of the sixth row have values of 0 , $2/8$, and 0 , respectively.

15. (Original) The system of claim 12 wherein the image processing unit is configured to generate the first and the second sub-frames using an error kernel.

16. (Original) The system of claim 15 wherein the error kernel comprises first, second, and third rows which each comprise three coefficients, wherein the three coefficients of the first row have values of $1/16$, $2/16$, and $1/16$, respectively, wherein the three coefficients of the second row have values of $2/16$, $4/16$, and $2/16$, respectively, and wherein the three coefficients of the third row have values of $1/16$, $2/16$, and $1/16$, respectively.

17. (Original) The system of claim 12 wherein the image processing unit is configured to generate third and fourth sub-frames comprising the plurality of rows of sub-frame pixel values, wherein each of the sub-frame pixel values in each of the plurality of rows is calculated using the image data, at least one sub-frame pixel value from a previous one of the plurality of rows, and at least one error value.

18. (Original) The system of claim 12 wherein the image comprises a plurality of image pixels, wherein each of the sub-frame pixel values corresponds to a sub-frame pixel that is centered with respect to one of the plurality of image pixels.

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19. (Original) The system of claim 12 wherein the image comprises a first plurality of pixels at a first resolution, and wherein the first and the second sub-frames comprise a second plurality of pixels at a second resolution less than the first resolution.

20. (Currently Amended) A system for generating sub-frames for display at spatially offset positions to generate the appearance of an image, the system comprising:

means for receiving image data corresponding to the image;

means for generating a plurality of rows of initial values using the image data;

means for accessing a row of history values and error values generated using the image data; and

means for generating a sub-frame pixel value using the row of history values and error values and the plurality of rows of initial values;

wherein the row of history values and error values and the plurality of rows of initial values comprise a plurality of columns, wherein a number of the plurality of columns corresponds to a number of iterations associated with generating the sub-frame pixel value.

21. (Canceled)

22. (Currently Amended) The system of claim 20 wherein a number of values in the row of history values and error values and each of the plurality of rows of initial values corresponds to ~~a~~the number of iterations associated with generating the sub-frame pixel value.

23. (Original) The system of claim 20 wherein the means for generating the sub-frame pixel value includes means for generating the sub-frame pixel value using the row of history values and error values, the plurality of rows of initial values, a first simulation kernel, a second simulation kernel, and an error kernel.

24. (Original) The system of claim 20 wherein the means for generating the sub-frame pixel value includes means for generating the sub-frame pixel value using the row of history values and error values, the plurality of rows of initial values, and a simulation kernel.

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25. (Currently Amended) A computer-readable medium storing computer-executable instructions, which, when executed by a computer processing system, cause the system to perform a method of generating a sub-frame image which comprises sub-frames for display at spatially offset positions to generate the appearance of a displayable image, comprising:

receiving image data corresponding to the displayable image;

generating a first plurality of initial values associated with a first pixel which corresponds to a first sub-frame using the image data;

generating a first sub-frame pixel value using the image data and the first plurality of initial values, wherein the first sub-frame pixel value comprises a first history value;

generating a first error value using the image data and the first plurality of initial values;

generating a second plurality of initial values associated with a second pixel which corresponds to a second sub-frame using the image data; ~~and~~

generating a second sub-frame pixel value using the image data, the second plurality of initial values, the first history value, and the first error value;

generating a third plurality of initial values associated with a third pixel which corresponds to a third sub-frame using the image data;

generating a third sub-frame pixel value using the image data and the third plurality of initial values, wherein the third sub-frame pixel value comprises a second history value;

generating a second error value using the image data and the third plurality of initial values; and

generating the second sub-frame pixel value using the image data, the second plurality of initial values, the first history value, the second history value, the first error value, and the second error value.

26. (Canceled)

27. (Currently Amended) The computer-readable medium of claim ~~26~~25 having computer-executable instructions, which, when executed by the computer processing system, cause the system to perform the method further comprising:

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generating a fourth plurality of initial values associated with a fourth pixel which corresponds to a fourth sub-frame using the image data; and

generating a fourth sub-frame pixel value using the image data, the fourth plurality of initial values, the first history value, and the first error value.

28. (Original) The computer-readable medium of claim 27 wherein the first history value, the second history value, the first error value, and the second error value comprise a first row of a sub-frame image.

29. (Original) The computer-readable medium of claim 27 wherein the first sub-frame pixel value and the third sub-frame value comprise a first row of a sub-frame image, and wherein the second sub-frame pixel value and the fourth sub-frame value comprise a second row of the sub-frame image.

30. (Original) The computer-readable medium of claim 28 wherein the first, the second, the third, and the fourth pixels are centered with respect to a corresponding image pixel in the image.